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Exploring the budget deficit-economic growth nexus: new evidence from Ghana

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ABSTRACT

In this paper, we combine Autoregressive Distributed Lag (ARDL) approach with trend analysis to assess the relationship between Ghana's budget deficit and economic growth from 2000 to 2015 using quarterly data. The trend analysis reveals that since 2000, years of high budget deficit were usually followed by years of low economic growth and vice versa. This phenomenon was pronounced in 2009, when the Gross Domestic Product (GDP) growth rate fell from 7.3 percent in 2008 to 4 percent in 2009, following an increase in the budget deficit from 8 percent in 2007 to 11.5 percent in 2008. The same phenomenon was observed between 2012 and 2015. The econometric results show a significantly negative effect of budget deficits on economic growth. Thus, a 100 percent increase in budget deficit in the long run would lead to a 3 percent decrease in real GDP, holding all other factors constant. The results confirm the Neoclassical proposition that high budget deficit does not necessarily translate into economic growth. The paper recommends that government must ensure strong fiscal discipline without compromising the wellbeing of the citizenry by allocating budget spending to sectors that can translate the deficit into high economic growth both in the short and long runs.

Keywords: Budget deficit, ARDL, error correction model, long and short run, economic growth.

1 INTRODUCTION

The implications of budget deficits for economic growth have remained one of the focal macroeconomic debates among policy makers and researchers (Georgantopoulos & Tsamis, 2011). This debate is deeply rooted in the theoretical controversy between the Neoclassical Economists and the Keynesian Economists. While the former assert that budget deficit impacts economic growth negatively, the latter hypothesize that budget deficits have a positive relationship with economic growth (Rahman, 2012). Several empirical studies suggest that although budget deficits are not a true representative of fiscal policy, and that it is not easy to estimate the impact of fiscal policy, fiscal deficits are the most reliable and measurable indicator for economic growth and development (Fischer, 1993). It is also important to stress that there is a bidirectional relationship between budget deficits and other macroeconomic indicators. However, budget deficits have been found to impact economic growth either positively or negatively depending on the sources of the deficit (Kneller et al., 1999). According to Eminer (2015), an increase in a budget deficit will impact economic growth positively if the deficit is geared towards productive spending and negatively if it is geared towards non-productive spending. In any case, the term "productive spending" is relative, and dependent on the discretion of the policy maker. Also, the full realization of the impact of budget deficits is dependent on the duration (short or long run) of the policy.

In the Ghanaian context, the debate between the positive versus negative impact of budget deficits on economic growth has been long-standing, particularly among politicians and policy makers. Since the first republic where the socialist agenda was adopted, budget deficits have been a common feature of Ghana's economic management (Larbi, 2012). Recently, this debate has been intensified, following the phenomenal increase in the government's budget deficit since 2012. The country's deficit has consistently increased from 4.3 percent in 2011 (Bank of Ghana, 2012) to 11.8 percent in 2012 (Bank of Ghana, 2013) before being reduced to 6.3 percent in 2015, which is still considered high compared to previous figures. The rise in the deficit has contributed to an increase in the country's gross public debt as a ratio of GDP, from 40 percent in 2011 to 72.6 percent at the end of November, 2015 (African Development Bank, Organization for Economic Cooperation and Development & United Nations Development Programme, 2015). Given the implications of the budget deficit for the economy, this study combines trend and econometric analyses to examine the relationship between budget deficits and economic growth in Ghana from the year 2000 to 2015.

Although a similar study has been conducted by earlier researchers (see Larbi, 2012, Akosah, 2013; Nkalu, Richardson & Nwosu, 2016), the scope of years covered in these studies is up to 2013. This study extends the scope further to 2015. Also, methodologically, this study uses the Autoregressive Distributed Lag (ARDL) approach which has not yet been used in the literature to analyze the relationship between budget deficit and economic growth in the Ghanaian context. The essence of using this approach is to attempt to validate the existing studies (see Nkalu, 2015), using a different approach from frameworks such as the Vector Error Correction Model (VECM), Seemingly Unrelated Regression (SUR) model, and Two-Stage Least Squares (2SLS), as well as Johansen cointegration procedure which have already been applied in the literature. The results of the econometric analysis, conducted to supplement the trend analysis, support the neoclassical proposition that high budget deficits do not necessarily translate into long term economic growth. Similarly, the trend analysis depicts elements of negative lag effects of high deficits on economic growth.

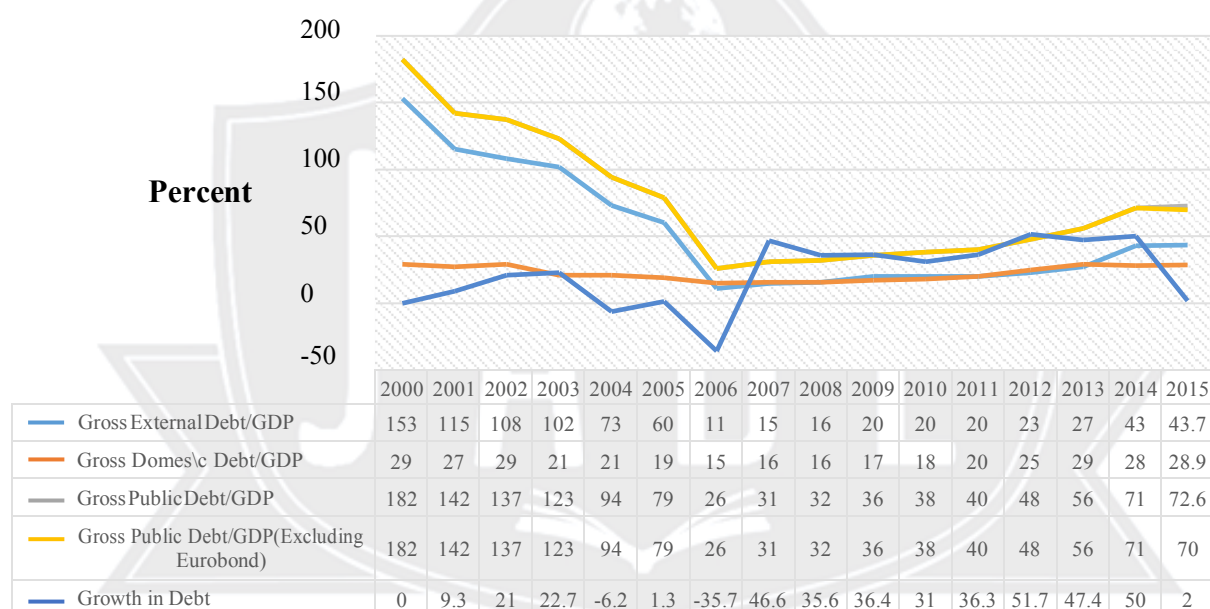
The rest of the paper is structured as follows: Section 1 presents a brief review of Ghana's economy from 2000 to 2015. It also reviews the theoretical and empirical literature on budget deficit-economic growth nexus both in Ghana and other parts of the world with a focus on developing countries that have the same features as Ghana. Section 2 presents the methodology used in the study, while sections 3 and 4 present the results, conclusion, and policy recommendation, respectively.

1.1 Overview of Ghana's economy (2000-2015)

Extant literature suggests that the Ghanaian economy has grown steadily, especially from 2001 to 2011. This is in part due to sound macroeconomic policies aided by high prices in primary commodities such as cocoa, timber, gold, and oil in 2011. In this paper, we juxtapose the performance of the economy from 2000 to 2008 with the period 2008 to 2012 and further place the current economic performance in context giving due cognizance to global developments. Retrospective analysis of the trend of some of the macroeconomic indicators (presented in Figure 1) reveal that prior to 2001, Ghana's economic performance was quite unimpressive. In 2000, the year-on-year inflation rate was as high as 40.5 percent, Real Gross Domestic Product (Real GDP) growth

was creeping at a rate of 3.7 percent coupled with a high budget deficit of 9.7 percent, and external debt of \$6,062.0 (Bank of Ghana, 2004).

One of the major challenges that the economy faced, especially from 2002 to 2007, was the difficulty in controlling the money supply growth and the country's vulnerability to severe supply shocks from weather and commodity price developments. However, the economy stabilized between 2000 and 2007 as inflation averaged 13.5 percent per annum (Centre for Policy Analysis, nd.). The government's decision to take advantage of the debt relief and debt cancellation provided by the IMF, World Bank, and bilateral donors under the Enhanced HIPC Initiative and Multilateral Debt Relief Initiative (MDRI), helped reduce Ghana's debt stock from 198.3 percent of national income in 2000, to 118.8 percent of national income at the end of December 2003, and further down to 41.9 percent of national income by the end of 2005 (Centre for Policy Analysis, nd.). As of the end of 2008, the estimated debt was 52 percent of national income (Bank of Ghana, 2008). As presented in Figure 1, the gross external debt as ratio of GDP stood at 16 percent while the growth in public debt was 35.6 percent.



Source: Authors' computation based Bank of Ghana Annual Reports

Figure 1: Trend of Ghana's debts (2000-2015)

A stabilized currency resulted in significant improvement in the country's Gross Domestic Product (GDP) growth, from an overall growth rate of 3.7 percent in 2000 to higher growth rates of 5.8 percent in 2004. This growth was mainly driven by an increase in Agricultural output by 7.5 percent, reflecting an upswing in cocoa production of over 700,000 tons during the 2003/04 crop season, the highest since the 580,000 tons recorded in 1964/65 crop season (Bank of Ghana, 2004). This was reflected in a reduction in poverty from 40 percent in 2000 to 31.9 in 2005 (Ghana Statistical Service, 2007). When oil prices hit their all-time high of 101 dollars per barrel in 2008, the Real GDP growth stood at 7.3 percent, inflation at 18 percent, and the deficit was 11.5 percent of GDP. Despite an increase in debt stock in 2008, the debt service burden remained within sustainable levels. The Debt-to-GDP ratio was 28.1 percent, the stock of gross international reserves was

US\$2,036.22 million, which was equivalent to 2.1 months of import cover at the end of 2008 (Bank of Ghana, 2008).

In 2009, there was a fall in GDP growth rate from 8.4 percent in 2008 to 4 percent, despite the effort of the government to ensure fiscal discipline (Bank of Ghana, 2009). The economy bounced back in 2010, and continued to experience impressive growth up to 2011. This impressive performance was due to multifaceted factors, including fiscal discipline of the government, especially from 2009 to 2011, which resulted in a decrease in the deficit from 11.5 percent of GDP in 2008 to 4.3 percent in 2011. Other factors included a consistent fall in oil prices together with the oil find and increase in commodity prices. The economy was considered the fastest growing economy in sub-Saharan Africa, with a GDP growth rate reaching an all-time high of 15 percent, with a stable inflation rate of 8.6 percent at the end of 2011 (African Development Bank, Organization for Economic Cooperation and Development & United Nations Development Programme, 2015). Gross international reserves at the end of 2011 were equivalent to 3.2 months of import cover.

The expectation of the Bank of Ghana and the government was that over the medium term to 2015, the economy would register robust growth of about 8 percent, bolstered by improved oil and gas production, increased private-sector investment, improved public infrastructure development, and sustained political stability. However, this expectation proved to be quite different from actual results, as the pace of growth moderated in 2012, reaching 8.8 percent, and further down to 7.1 percent (Bank of Ghana, 2012) in 2013 compared to the 15 percent growth seen in 2011. The downward trend was observed in 2014, as the country's growth rate of 4.2 percent was below the Sub-Saharan African (SSA) average of 5.0 percent (International Monetary Fund, 2015). In 2015, the economy grew at a rate of 4.1 percent while the single digit inflation rate achieved from 2010 to 2011 began to increase persistently, up to a rate of 19.0 percent in January 2016. The consistently low growth has been ascribed to factors such as the fall in supply of power for economic activities, increasing trend of government budget deficits, and external debt accumulation.

1.2 Review of Literature

Generally, there are three schools of thought concerning the economic effects of budget deficits: Neoclassical, Keynesian and Ricardian. Among the mainstream analytical perspectives, the neoclassical economists consider fiscal deficits to be detrimental to investment and growth, while in the Keynesian paradigm, it constitutes a key policy prescription (Rahman, 2012). Theorists persuaded by Ricardian equivalence assert that fiscal deficits do not really matter except for smoothening the adjustment to expenditure or revenue shocks. While the Neoclassical and Ricardian schools focus on the long run, the Keynesian view emphasizes the short-run effects (Van & Sudhipongpracha, 2015). Existing empirical studies on the relationship between deficits and economic growth are mixed, with one strand of the literature suggesting that high budget deficits have a positive relationship with economic growth, while the other strand asserts otherwise. Mohanty (2012) employed the Johansen Cointegration test, Granger Causality test, And Vector Error correction Model to examine the short-run and long-run relationship between fiscal deficit and economic growth in India from 1970 to 2012. The study found a negative and significant relationship between fiscal deficits and economic growth in the long run. The short-run results, on the other hand, found the relationship between fiscal deficits and economic growth to be

insignificant. However, the results reveal that the negative impact of the post-reform fiscal deficit on economic growth is more than the impact pre-reform fiscal deficit.

Rahman (2012) investigated the relationship between budget deficits and economic growth from Malaysia's perspective using quarterly time series data from 2000 to 2011 and the ARDL approach. The authors found no evidence of a long-run relationship between budget deficits and economic growth which confirmed the Ricardian equivalence hypothesis. According to the author, a productive expenditure rather had a positive and significant relation with economic growth. Cinar, Eroglu and Demirel (2014) also employed the panel ARDL model to analyze the European Debt Crisis stemming from the 2008 Global Crisis within Keynesian budget deficit policies using data from 2000Q1-2011Q4. The study revealed that conjunctural deficit policy (functional fiscal policy) had a positive effect on economic growth in the short run. The estimated long-run results showed that budget deficit policies had no effect on economic growth.

Using quarterly data from 2000-2012 and Vector Error Correction Model (VECM), Akosah (2013) investigated the threshold effect of budget deficits on economic growth in the Ghanaian case. The results indicated an inverse long-run relationship between deficits and economic growth, suggesting that high deficits slow down economic growth. In the short run, however, the author found the budget deficit promoted economic growth, but a deficit beyond the threshold level of 4 percent of GDP was found to be detrimental to economic growth. The same negative long-run relationship was obtained by Nkalu (2015), who applied the Vector Error Correction Model (VECM), Seemingly Unrelated Regression (SUR) model, and Two-Stage Least Squares (2SLS) approach in Ghana and Nigeria. Larbi (2012) conducted similar study covering the period of 1980 to 2010, using the Johansen cointegration procedure and Granger Causality test, and concluded that budget deficits exert no significant long-run impact on economic growth. However, further evidence from the Granger Causality test suggested statistically significant and positive long-run relationships between deficit and economic growth. This brief review shows that the direction and extent of relationship remain inconclusive in the literature, hence the need for further validations using different approaches and expansion on the scope of years.

2 METHODOLOGY AND DATA

In assessing the causal relationship between government budget deficit and economic growth, most authors employ rigorous econometric processes and methods, such as the Vector Autoregressive (VAR) and the Vector Error Correction Model (VECM) framework. In this study, we move further and employ both Autoregressive Distributed Lag (ARDL) and trend analysis to understand the factors underlying the relationship between government budget deficits and economic growth in Ghana. One of the major reasons for complementing the econometric analysis with trend analysis is that trend analysis offers a measurable and verifiable method for predicting the outcomes of the econometric analysis. It provides adequate information on the potential direction of the relationship between economic growths as the response variable and budget deficit as the explanatory variable of interest using the ARDL approach. The trend analysis also has the advantage of being based on verifiable data that can be subjected to thorough scrutiny for validation. It can be replicated, checked, updated, and refined using the accompanying data. However, the simple trend analysis is not sufficient for one to draw valid inference. In essence, the trend analysis was used as a method for validating the econometric results. As a result, the study uses econometric

techniques by following Mohanty (2012). The mathematical model used to evaluate the relationship between government budget deficit and economic growth is specified as:

$$RGDP = f(DEF, CPI, GOV, OP, REER, K, L) \quad (1)$$

Where $RGDP$ is real gross domestic product, DEF is government budget deficit, CPI is consumer price index (inflation), GOV is government expenditure, OP is oil price, $REER$ is real effective exchange rate, K is capital stock and L is labour force.

$$RGDP = \beta_0 + \beta_1 DEF_t + \beta_2 CPI_t + \beta_3 GOV_t + \beta_4 OP_t + \beta_5 REER_t + \beta_6 K_t + \beta_7 L_t + \varepsilon_t \quad (2)$$

Taking natural logs of equation (2) for linearity gives equation (3)

$$\ln RGDP = \beta_0 + \beta_1 \ln DEF_t + \beta_2 \ln CPI_t + \beta_3 \ln GOV_t + \beta_4 \ln OP_t + \beta_5 (REER_t) + \beta_6 \ln K_t + \beta_7 \ln L_t + \varepsilon_t \quad (3)$$

Differencing equation (3), the growth equation is finally given as;

$$\ln \Delta RGDP = \beta_0 + \beta_1 \Delta \ln DEF_t + \beta_2 \Delta \ln CPI_t + \beta_3 \Delta \ln GOV_t + \beta_4 \Delta \ln OP_t + \beta_5 \Delta (REER_t) + \beta_6 \Delta \ln K_t + \beta_7 \Delta \ln L_t + v_t \quad (4)$$

Where \ln is the natural logarithmic operator and Δ is the difference operator. The coefficients $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and β_7 are the elasticities of the respective variables, β_0 is the drift component, t denotes time and v_t is the error term.

The study employed the Autoregressive Distributed Lag (ARDL) model by Pesaran and Shin (1999); Pesaran, Shin, and Smith (2001) and Pesaran and Pesaran (2009) to determine the long and short-run relationship between budget deficit and economic growth. This is as a result of the advantages that the ARDL approach to cointegration has over the Johansen approach to cointegration. In the first instance, the ARDL model is the more statistically significant approach to determine the cointegration relation in small samples (Ghatak & Siddiki, 2001), while the Johansen cointegration techniques require large data samples for validity. Whereas the Johansen cointegration techniques require all the regressors to be integrated of the same order, the ARDL approach can be applied whether the regressors are $I(1)$ or $I(0)$. This means that the ARDL approach avoids the pre-testing problems associated with standard cointegration, which requires that the variables be already classified into $I(1)$ or $I(0)$ (Pesaran et al., 2001). Tang (2006) also stated that the ARDL procedure is also applicable when the explanatory variables are endogenous and it is sufficient to simultaneously correct for residual serial correlation. The ARDL approach to cointegration involves estimating the short run and long-run elasticities by employing the Unrestricted Error Correction Model (UECM) that has unrestricted intercepts and no trends based on the assumption made by Pesaran *et al.* (2001). From the analysis, equation (3) can be expressed in ARDL representation as:

$$\begin{aligned}
\Delta \ln RGDP_t = & \beta_0 + \alpha \ln RGDP_{t-1} + \beta_1 \ln DEF_t + \beta_2 \ln CPI_t + \beta_3 \ln GOV_t + \beta_4 \ln OP_t + \beta_5 REER_t \\
& + \beta_6 \ln K_t + \beta_7 \ln L_t + \sum_{i=1}^P \Phi \Delta \ln RGDP_{t-i} + \sum_{i=1}^P \varphi_{1i} \Delta \ln DEF_{t-i} + \sum_{i=1}^P \varphi_{2i} \Delta \ln CPI_{t-i} \\
& + \sum_{i=1}^P \varphi_{3i} \Delta \ln GOV_{t-i} + \sum_{i=1}^P \varphi_{4i} \Delta \ln OP_{t-i} + \sum_{i=1}^P \varphi_{5i} \Delta (REER)_{t-i} + \sum_{i=1}^P \varphi_{6i} \Delta \ln K_{t-i} \\
& + \sum_{i=1}^P \varphi_{7i} \Delta \ln L_{t-i} + v_t
\end{aligned} \tag{4}$$

Where Δ is the first difference operator, P is the lag order selected by the Schwarz Bayesian Criterion (SBC), β_0 is the drift parameter and v_t is the error term which is $N(0, \delta^2)$. The parameters α and β_0 represent the long-run multipliers whereas Φ and φ are short-run parameters. The first step in the ARDL approach is to estimate equations (4) by applying OLS. The computed F-test (Wald test) is then used to test the existence of long-run relationships among the variables. This is done by restricting the coefficients of the lagged level variables to zero. The null hypothesis of no long-run relationship among the variables in equation (4) is tested against the alternative hypothesis. This is specified as:

$$\begin{aligned}
H_0: & \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0 \\
H_1: & \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq 0
\end{aligned}$$

Given that cointegration is established, the following ARDL model is estimated in order to obtain the long run and short run coefficients.

$$\begin{aligned}
\ln RGDP_t = & \omega_0 + \sum_{i=1}^P \lambda \ln RGDP_{t-i} + \sum_{i=1}^P \beta_1 \ln DEF_{t-i} + \sum_{i=1}^P \beta_2 \ln CPI_{t-i} + \sum_{i=1}^P \beta_3 \ln GOV_{t-i} \\
& + \sum_{i=1}^P \beta_4 \ln OP_{t-i} + \sum_{i=1}^P \beta_5 \Delta (REER)_{t-i} + \sum_{i=1}^P \beta_6 \ln K_{t-i} + \sum_{i=1}^P \beta_7 \ln L_{t-i} + v_t
\end{aligned} \tag{5}$$

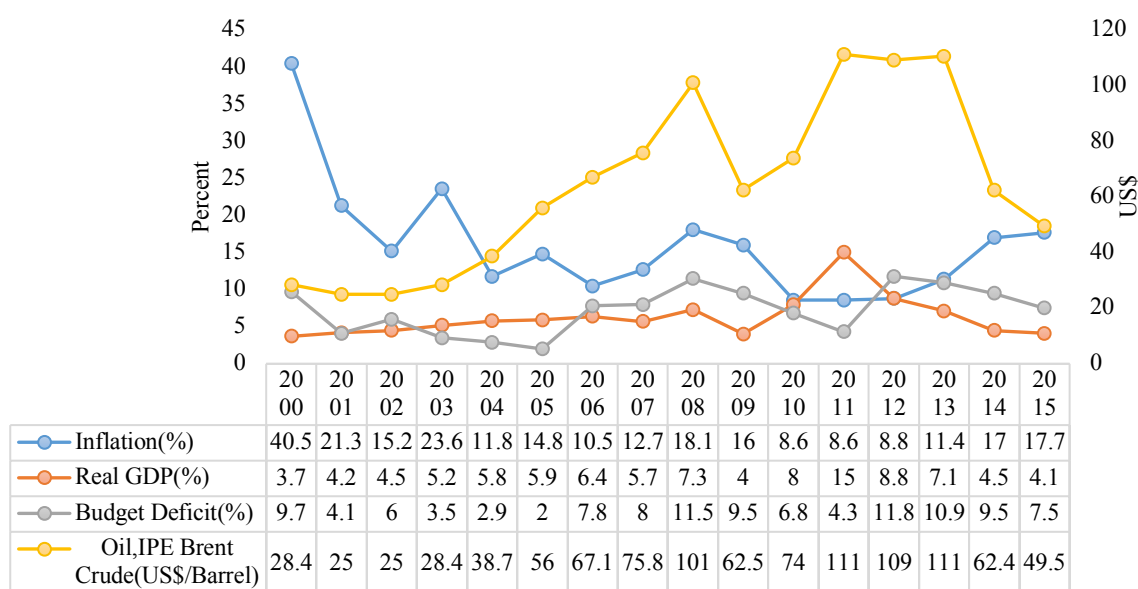
The error correction representation of the ARDL model is specified as:

$$\begin{aligned}
\Delta \ln RGDP_t = & \lambda_0 + \sum_{i=1}^P \Phi \ln RGDP_{t-i} + \sum_{i=1}^P \varphi_{1i} \Delta \ln DEF_{t-i} + \sum_{i=1}^P \varphi_{2i} \Delta \ln CPI_{t-i} \\
& + \sum_{i=1}^P \varphi_{3i} \Delta \ln GOV_{t-i} + \sum_{i=1}^P \varphi_{4i} \Delta \ln OP_{t-i} + \sum_{i=1}^P \varphi_{5i} \Delta (REER)_{t-i} + \sum_{i=1}^P \varphi_{6i} \Delta \ln K_{t-i} \\
& + \sum_{i=1}^P \varphi_{7i} \Delta \ln L_{t-i} + \psi ECT_{t-1} + \epsilon_t
\end{aligned} \tag{6}$$

Where ψ represents the speed of adjustment to long-run equilibrium following a shock to the system and ECT_{t-1} is the error-correction term, the residuals from the cointegration equation lagged one (1) period. The coefficient of the lagged error correction term ψ is expected to be negative and statistically significant to further confirm the existence of a cointegrating relationship among the variables in the model. The data used for this analysis were obtained from the annual reports of the Bank of Ghana from 2000 to 2015 and World Development Indicators (World Bank, 2016).

3 RESULTS AND DISCUSSION

In order to understand the relationship between real gross domestic product and budget deficits over the years, we present in Figure 1 the growth trend of real GDP, budget deficit, and other selected variables from the year 2000 to 2015. The analysis reveals that since 2000, years of high deficits were usually followed by years of low economic growth, and vice versa. This phenomenon was pronounced in 2009, where the GDP growth rate reduced from 7.3 percent in 2008 to 4 percent in 2009, following an increase in budget deficit from 8 percent in 2007 to 11.5 percent in 2008. The same phenomenon was observed between 2012 and 2015. The Figure also shows that periods of high inflation were associated with low growth of real GDP, and vice versa.



Source: Authors' computation based on Bank of Ghana Annual Reports

Figure 2: Inflation, Real GDP, Oil price and Budget deficit (2000-2015)

3.1 Unit root and cointegration tests

Before carrying out the ARDL or Bounds test to cointegration, and the Granger-causality test, a unit roots test was first conducted in order to examine the stationarity properties of the variables in the study. While the ARDL approach to cointegration does not necessitate the pretesting of the variable for unit roots, it is imperative to perform unit roots test to verify whether the variables are not integrated of an order higher than one, to avoid spurious results. This is necessary, because the computed F-statistics provided by Pesaran *et al.* (2001) are not valid in the presences of $I(2)$

variables. The results from the unit roots test indicates that all the variables of interest are integrated of order one ($I(1)$) variables. The study conducted a cointegration test to examine the long run relationships among the variables. The F-statistic that is computed within the framework of the Unrestricted Error Correction Model was compared with the lower and upper critical values in Pesaran and Pesaran (2009). Table 3 reports the bounds test results for Real GDP (RGDP). From Table 3, the F-statistic for the model with Real GDP ($LRGDP$) as the dependent variable is $FLRGDP(.) = 4.332$. It exceeds the upper critical bound at one percent significance level. This means that the null hypothesis of no cointegration among the variables is rejected. This suggests the existence of a long-run relationship between economic growth and its explanatory variables.

Table 3: Bounds test for the existence of cointegration

Critical Value Bounds	90% Level		95% Level		99% Level	
Intercept with no trend	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
K=7	2.035	3.153	2.365	3.553	3.027	4.296
Dependent Variable						F-Statistic
$F(LRGDP) = F(LRGDP LBD, LCPI, LGOV, LOP, REER, LK, LL)$						4.332

Note: K is the number of regressors.

Source: Authors' estimated using WDI (2012) data and Microfit 4.1 package

3.2 Long and short-run analysis

Given that the results of the cointegration analysis indicate the existence of a long-run relationship between economic growth and the explanatory variables, the study proceeded to estimate the long-run impact of the explanatory variables on economic growth using the ARDL framework. The a priori expectation is that government budget deficit should translate into high economic growth, especially in the long run. Intuitively, one expects that if government budget deficits were invested in productive sectors of the economy and in diversified manner, they should propel economic growth, at least in the long run. However, the results (presented in Table 4) show a significantly negative relationship between budget deficit and economic growth. This shows that a 100 percent increase in budget deficit in the long run would lead to a 3 percent decrease in real GDP, holding all other factors constant. The implication is that government budget deficits over the past decade have been counterproductive to the growth of Ghana's economy. This result is consistent with that of Fisher (1993) who found a negative effect of budget deficit on economic growth. It also corroborates a similar study conducted by Mohanty (2012), which found a negative and significant relationship between fiscal deficit and economic growth in India.

In the Ghanaian context, the result supports the earlier study by Akosah (2013) and Nkalu (2015), who found an inverse long-run relationship between budget deficit and economic growth, especially as the deficits have often been used to finance recurrent expenditures, suggesting that high budget deficit, driven by recurrent expenditures, slows down economic growth. However, the result is in contrast with findings of Larbi (2012) who concluded that budget deficit has a positive significant relationship with economic growth in Ghana. Again, whereas capital stock and growth of labor force have a positive and significant impact on economic growth, the consumer price index and oil price were found to have a significant and negative impact on economic growth. Nonetheless, the long-run estimate of real exchange rate and government expenditure were insignificant.

Table 4: Long Run Model

Variables	Coefficient	Standard Error	T-Ratio	Probability
LBD	-0.0334	0.0107	-3.1194	[0.004]***
LCPI	-0.2680	0.0763	-3.5139	[0.001]***
LGOV	0.4498	0.0293	1.5331	[0.134]
LOP	-0.0060	0.0019	-3.1271	[0.004]***
REER	-0.8041	0.0040	-0.1995	[0.843]
LK	0.1541	0.0422	3.6484	[0.001]***
LL	0.6809	0.1257	5.4168	[0.000]***
C	-26.9877	6.1004	-4.4239	[0.000]***

Source: Estimated from WDI (2012) and BP Statistical Review data using Microfit 4.1 package Note: ***, ** and * denotes significance at 1%, 5% and 10% respectively

Table 5 presents the short-run results of the growth model. The results show that the coefficient of the error correction term (ECT) is negative and highly significant at one percent level. This confirms the existence of a cointegrating relationship among the variables in the model. The ECT represents the rate of adjustment to restore equilibrium in the dynamic model following a disturbance. The coefficient of the error correction term (ECT) is -0.32. This suggests that the speed of adjustment to long-run equilibrium is approximately 32 percent per quarter. The size of the coefficient of the error correction term (ECT) indicates that about 32 percent of the disequilibrium in the product market that has been caused by previous quarters' shocks converges back to the long-run equilibrium in the current quarter. However, the magnitude of the coefficient in this study suggests that the speed of adjusting to long-run changes is slow. The short-run results again show that budget deficit is positive but insignificant. This implies that changes in budget deficit do not have any immediate effect on the growth of the economy. This can be partly due to the fact that government spends mostly on long-term projects such as education, construction of roads, and other infrastructural projects whose impacts are not observed in the short term; neither are there sufficient complementary projects to propel the short-run positive impact in to long-run positive impact. The results of the error correction model confirm the findings of Mohanty (2012) who discards the short-run relationship between fiscal deficit and economic growth.

Table 5: Error Correction Model

Variables	Coefficient	Standard Error	T-Ratio	Probability
dLRGDP(-1)	0.7264	0.1619	6.9573	[0.000]***
dLRGDP(-2)	0.6332	0.0897	7.0591	[0.000]***
dLRGDP(-3)	0.6823	0.0937	7.2818	[0.000]***
dLBD	0.0016	0.0095	0.1684	[0.863]
dLCPI	0.1259	0.0647	1.9459	[0.059]*
dLGOV	-0.2387	0.0411	-5.8084	[0.000]***
dLGOV(-1)	0.1988	0.0456	4.3543	[0.000]***
dLOP	-0.2291	0.0015	0.1444	[0.886]
dREER	-0.0386	0.0022	-17.1600	[0.000]***
dREER(-1)	0.0235	0.0054	4.2974	[0.000]***
dLK	0.1691	0.0386	4.3786	[0.000]***
dLK(-1)	-0.1672	0.0363	-4.6064	[0.000]***
dLL	0.4939	0.1543	3.2009	[0.002]***

dLL(-1)	-0.5610	0.2024	-2.7717	[0.015]**
dLL(-2)	-0.6610	0.1827	-3.6179	[0.002]***
C	17.5542	4.2573	4.1233	[0.000]***
ECT(-1)	-0.3252	0.0688	-4.7219	[0.000]***

Source: Estimated from WDI (2016) data using Microfit 4.1 package Note: ***, ** and * denotes significance at 1%, 5% and 10% respectively

3.3 Granger causality test results

In some instance, there is a bidirectional relationship between the dependent variable (which is economic growth in the case of this study) and the explanatory variable of interest (budget deficit). Since this is not known from the data used, the Granger Causality test (presented in Table 6) was conducted. The results suggest that the null hypothesis, that budget deficit (*LBD*) does not Granger cause real GDP (*LRGDP*), is rejected, indicating that budget deficit Granger cause real GDP. The implication is that budget deficit predicts future values of real GDP. However, the null hypothesis that real GDP does not Granger cause budget deficit is not rejected. This means that, there is a unidirectional causality running from budget deficit to real GDP.

Table 6: Pairwise granger causality tests

Null Hypothesis	F-Stat	Prob	Remarks
<i>LBD</i> does no Granger Cause <i>LRGDP</i>	8.8442	0.000***	H ₀ is rejected
<i>LRGDP</i> does no Granger Cause <i>LBD</i>	2.3767	0.102	H ₀ is not rejected

Source: Computed using Eviews 9.0 package.
Note: *** denote rejection of null hypothesis at 1% level of significance.

4 CONCLUSION AND POLICY IMPLICATION

Since 2012, there have been growing concerns over Ghana's high budget deficits, and their implication for the country's debt sustainability and economic growth. This paper analysis the relationship between government budget deficit and economic growth using data from Bank of Ghana and the World Bank. The trend analysis used to validate the econometric results reveals that, since 2000, years of high budget deficit were usually followed by years of low economic growth, and vice versa. This phenomenon was pronounced in 2009 where the GDP growth rate reduced from 7.3 percent in 2008 to 4 percent in 2009, following an increase in the deficit from 8 percent in 2007 to 11.5 percent in 2008. The same phenomenon was observed between 2012 and 2015. The econometric result shows that there is a negative long run relationship between budget deficit and economic growth. This finding is in conformity with the prediction of the Neoclassical Economists that high budget deficits do not necessarily translate into economic growth in the long run. Instead, they lead to crowding in effect only in the short run, and shift tax burdens into the future. Budget deficits result in an increase in current private consumption, and a decline in personal savings. Higher interest rates caused by declining personal savings decrease private investments (the crowding out effects) and hence affect economic growth negatively.

Following the observed negative effect of budget deficits on economic growth, this paper recommends that government must ensure strong fiscal discipline without compromising the wellbeing of the citizenry by allocating budget spending to sectors that can translate the deficit

into high economic growth, both in the short and long runs. The government could consider spending in sectors that could boost aggregate demand, private savings, investment, and economic growth. There is the need for government to maintain a strong fiscal consolidation that will contribute to minimizing the country's growing debt (partly due to borrowing), by keeping with its policy of strict expenditure controls. While ensuring strong fiscal discipline, it must also improve its revenue collection performance to offset the fiscal imbalance. The paper further recommends that government should use its monetary policy rate to moderate the real effective exchange rate and inflation, since their increase were found to have negative implications for the growth of the economy.

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Appendix 1

Table A1: Test for Order of Integration (ADF and PP) at levels with intercept

Variable	ADF Statistic	P-Value	Lag Length	PP Statistic	P-Value	BW
LRGDP	-1.4980	(0.528)	[0]	-1.5111	(0.521)	[2]
LBD	-2.0789	(0.253)	[2]	-2.3909	(0.148)	[2]
LCPI	-2.9511	(0.145)	[2]	-2.5047	(0.119)	[1]
LGOV	-1.5874	(0.483)	[1]	-1.2204	(0.661)	[2]
LOP	-1.8698	(0.344)	[2]	-1.5857	(0.483)	[2]
REER	-0.8154	(0.807)	[1]	-1.7836	(0.385)	[1]
LK	-1.8360	(0.360)	[1]	-1.6132	(0.470)	[2]
LL	-1.7918	(0.381)	[2]	1.9700	(0.299)	[2]

Notes: Null hypothesis: there is unit root. Alternative Hypothesis: there is no unit root. If the p-values for the ADF and PP tests are not significant then we cannot reject the null hypothesis and vice versa.

Table A2: Test for Order of Integration (ADF and PP) at First Differences with intercept

Variable	ADF Statistics	P-Value	Lag Length	PP Statistics	P-Value	BW
DLRGDP	-7.3814	(0.000)***	[0]	-7.3875	(0.000)***	[2]
DLBD	-3.4031	(0.014)**	[3]	-4.8282	(0.000)***	[3]
DLCPI	-3.1777	(0.026)**	[2]	-2.7490	(0.071)*	[4]
DLGOV	-3.8849	(0.003)***	[0]	-3.9929	(0.002)***	[2]
DLOP	-2.8551	(0.057)*	[4]	-4.1222	(0.001)***	[4]
REER	-7.0068	(0.000)***	[1]	-5.5092	(0.000)***	[5]
DLK	-4.2578	(0.001)***	[0]	-4.3318	(0.000)***	[2]
DLL	-7.3982	(0.000)***	[2]	-9.8793	(0.000)***	[2]

Notes: Null hypothesis: there is unit root. Alternative Hypothesis: there is no unit root. If the p-values for the ADF and PP tests are not significant then we cannot reject the null hypothesis and vice versa. *** represents significance at 1% level.

